

AP20 Rec'd PCT/PTO 27 APR 2006
Device for singulating overlapping flat mailings

The invention relates to a device for singulating overlapping flat mailings in accordance with the preamble of claim 1.

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Single-stage (US 3 372 925; US 2 941 653) and multistage (US 6 135 441 A) singulating devices are known. For multistage singulating devices the individual stages of the singulating device are spatially separated from each other. These are belt drive groups (US 6 135 441 A) arranged separately one behind the other. This means that gaps (roller diameter +
10 twice belt thickness + safety distance) occur between the individual stages in the conveyor system. The mailings are no longer supported over their complete length in these transition gaps, but instead only driven/held over a short belt length. Because of this, uncontrolled changes in position (rotations) of the mailings can occur during accelerating (braking). When the front edge enters the succeeding conveyor section brief travel malfunctions, or damaged
15 mailings (folding) can occur, depending on the angle at which the front edge of the mailing contacts the end of the roller.

The device known from US 2 941 653 includes a singulating section in which the mailings are also accelerated and an acceleration section in which the mailings are further
20 accelerated and in which additionally, in the case of a double conveyance, one of the two mailings is discharged.

In the known solutions, the position of the mailings is monitored by means of light barriers.

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From FR 2 657 857 A1 the transfer of mailings over a transition gap between two transport sections with different travel speeds is known. From US 3 372 925, US 2 941 653 and US 1 858 320 it is known in each case how mailings can be transferred between two conveyor sections at different travel speeds without transition gaps. Individually mounted
30 deflection rollers of the conveyor belts of two adjacent conveyor sections arranged at an alternating height on a common axis are known for this purpose from US 3 372 925 and from US 1 858 320.

The object of the invention is to provide a device for singulating overlapping flat mailings, that even where the mailings differ considerably with regard to length, height, thickness or stiffness, has a high throughput, a low overlap rate at the end of the device and a low mailing damage rate.

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The object is achieved in accordance with the invention by the features of claim 1.

In this case, the speed of travel of the conveyor belts in each singulating section is greater than the speed of travel of the conveyor belts of the singulating section located upstream thereof in the direction of travel. Individually mounted deflection rollers of the conveyor belts of both adjacent singulating sections are placed at different heights along a common axis at each transition between the singulating sections. Thus when singulating there is a multistage acceleration without transition gaps between the stages, which enables an absolutely impact-free mailing transition to the succeeding singulating section. Because of the multistage arrangement, the forces acting on the mailings during acceleration can be kept relatively low.

Advantageous embodiments of the invention are shown in the subclaims. To ensure a safe transition of mailings to the succeeding singulating section without shifting relative to each other, it is advantageous if the conveyor belts receiving the mailings have a higher coefficient of friction than the conveyor belts transferring the mailings.

In this connection it is furthermore advantageous to arrange the mailings behind the receiving conveyor belts in the transition area at vacuum chambers pulling the conveyor belts.

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Furthermore, it is advantageous for this purpose if at each transition between the singulating sections the receiving area of the downstream singulating section has one conveyor belt more than the transferring area of the upstream singulating section. The middle singulating sections in this case have two conveyor belt areas connected by a common wide coupling roller, with the receiving conveyor belt area in these singulating sections of the particular mailings having one conveyor belt more than the transferring conveyor belt area.

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To monitor and control the singulating in the singulating sections, each singulating section advantageously has a measuring device for recording the speed of the mailings in the receiving area.

5 So that no interfering forces act on the mailings during the transition of the mailings to the downstream singulating section and to better separate overlapping mailings, it is therefore advantageous if the drive of the conveyor belts of the singulating section upstream in each case in the direction of travel can be switched off or its speed reduced, if the mailing arriving in the particular downstream singulating section has reached the speed of the receiving
10 conveyor belts. The switch off and reduction persists until a clearance between the mailings, specified for each singulating section, has been determined by a line of light barriers arranged along the path of travel.

 In this connection it is also advantageous that, in addition to the vacuum of the
15 vacuum chamber of the upstream singulating section in the direction of travel in each case can be switched off or reduced, if the incoming mailing to the downstream singulating section in each case reaches the speed of the receiving conveyor belt. The shutdown and reduction persists until a clearance between the mailings, specified for each singulating section, has been determined by a line of light barriers arranged along the path of travel.

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 For a cost-effective and flexible arrangement of the retention function it is advantageous if the retention element is secured to an immovable belt running along the length of all singulating sections.

25 The invention is explained with the aid of drawings using an exemplary embodiment.

 The drawings are as follows:

 FIG 1 A plan view of a section of the path of travel,

30 FIG 2 A section view through the deflection rollers of the conveyor belts at the transition between the singulating sections.

Individually mounted deflection rollers 1 of the conveyor belts 3, that are driven by a drive motor 12 in each singulating section 4, 5, 6, are mounted on a common axis 2 at each transition of the singulating sections 4, 5, 6. The transition gap in the mailing stream of the vertical mailings, that stand on an underfloor conveyor 14 in the path of travel, is thus
5 reduced to 0 mm. This arrangement enables an absolutely impact-free mailing transfer to the succeeding singulating section 5.6.

Due to the alternating arrangement of the conveyor belts 3 in the individual singulating stages 4, 5, 6, the retaining elements 7, acting between the conveyor belts 3, of the
10 immoveable belt 7a must also alternate in height. Mailings 8 that have caught on one another on holes or clips, i.e. multiple extractions, can be more easily separated from each other due to the different contact points of the retaining elements 7 on the mailings 8.

The conveyor belts 3 forming a closed contact area in the direction of travel at the
15 deflection rollers 1 in combination with a measuring device 9 measuring the speed of the mailings enable a precise control of the mailings within all singulating sections 4, 5, 6. The first singulating section 4, that can only be partially seen (mailing stack and feeder bed are not illustrated) has a defined lower speed V1 than the succeeding singulating unit 5 with speed V2. The speed of the mailings is continuously scanned by the measuring device 9. If in the
20 singulating section 5 this speed reaches V2, the first singulating section 4 is immediately switched off and kept switched off (or if appropriate only reduced in speed) until a specified gap is detected by a line of light barriers 13. The overlapping belt arrangement at the transfer points of the singulating sections 4, 5, 6 guarantees that a mailing that is still in the feeding first singulating section 4 is retained. The earliest possible separation (gap creation) of the
25 mailings is thus achieved.

If the conveyor belt is additionally supported by vacuum, stationery vacuum chambers
10 of the particular receiving singulating section 5, 6 are advantageously arranged close to the transition to the previous singulating section 4, 5. The mailing to be accelerated is in the
30 succeeding singulating section 5 pulled early by means of its vacuum chamber 10 onto its conveyor belt 3, so that the driving force is increased.

The early and safe transfer of mailings is further supported by the following feature:

The singulating sections 4, 5, 6 are divided so that when entering the succeeding singulating section 5, 6 running at higher speed one conveyor belt more than at the section end of the transferring singulating section 4, 5 is present. The driving forces of the receiving
5 singulating section 5, 6 on the mailing are therefore greater than the driving forces of the transferring singulating section 4, 5.

The center singulating section 5 is additionally divided into a receiving area 5a and a transfer area 5b to maintain the above condition. The drive coupling of the two areas 5a, 5b
10 in this example consists of a wide coupling roller 11. The complete singulating section 5 here is driven by a motor 12.